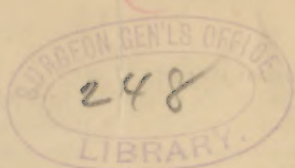


Judson (A. B.)



## A PRACTICAL POINT IN THE MECHANICAL THERAPEUTICS OF HIP-DISEASE.

BY  
A. B. JUDSON, M. D.

Read before the Medical Society of the County of New York, November 28th, 1881.

Reprinted from MEDICAL GAZETTE, December 10th, 1881.

In the use of the hip-splint it has been observed that the straps which are fastened to the adhesive plasters, at the lower part of the apparatus, for the purpose of extension, become relaxed whenever the patient assumes the erect position, and throws his weight upon the splint. This point has been referred to, more or less in detail, by Drs. Hutchison,\* of Brooklyn, Newton M. Shaffer,† of this city, A. J. Steele,‡ of St. Louis, and Edward H. Bradford,§ of Boston. It has doubtless attracted the attention of every observant practitioner who has used Taylor's splint.

I purpose, in a very few words, to inquire into the causes of this relaxation, and to consider methods for its prevention. One of the possible causes is to be found in the yielding nature and gravity of the tissues lying between the long bones of the limb and the skin to which the adhesive plasters are attached. These soft parts naturally occupy a lower position on the limb when the individual is standing than when he is recumbent. It is obvious, therefore, that the skin and the adhesive plasters will descend, when the

patient stands, by the weight of the subjacent soft parts, and that thus a relaxation of the extension-straps may attend a change from the recumbent to the erect position. It is found, however, in practice, that the traction exerted by the rack and pinion when the patient is recumbent, draws down the adhesive plasters and the skin to such an extent that their position is not further affected by the gravitation of the subjacent tissues when the patient stands.

The weight of the limb itself might be considered as contributing to a descent of the foot, and a relaxation of the extension-straps if only we could predicate sufficient laxity of the ligaments of the hip and knee and a wide enough separation of the articular surfaces of these joints. The mobility and weight of the soft parts of the limb, and the weight of the pendent limb may, therefore, be dismissed from consideration as causes of the relaxation of the extension-straps in the standing position of the patient.

The two causes mentioned above depend for their existence, or supposed existence, solely on the erect position of the patient. There is, however, another set of causes which come into action when the patient is not only simply standing, but also standing with the foot of the unaffected, or well, side raised from the ground. When this position is taken, as it is necessarily at every step in

\* Contributions to Orthopedic Surgery, by Joseph C. Hutchison, M.D., New York, 1880, p. 15.

† Archives of Medicine, Oct. 1880, pp. 197-199.

‡ St. Louis Courier of Medicine, Oct. 1880, pp. 354,

355.

§ Boston Medical and Surgical Journal, Nov. 11, 1880, p. 467.

locomotion, the entire weight of the body is thrown onto the splint. When the weight of the body is thus transferred to the splint a relaxation of the extension-straps may be caused, firstly, by the too light construction of the steel frame of the apparatus. If the upright be flexible the weight of the body will cause it to bend, with a convexity towards the outer side and, as necessary incidents, a descent of the pelvic band and the patient's body, an approach of the heel to the foot piece of the splint and a relaxation of the extension-straps. And if this be true of a too lightly constructed upright, it will be more emphatically true of a light and flexible pelvic band, which is subtended by the perineal straps in such a manner that, if not heavily made, its two ends will be drawn towards each other with, of course, a lowering of the perineal straps, a descent of the body and a relaxation of the extension-straps.

In the second place, the relaxation noticed in the extension-straps when the patient throws his weight onto the perineal straps may be caused by such an arrangement of the parts of the splint that the pelvic band occupies too high a position on the body of the patient. If the pelvic band is too high the perineal straps hang so deeply looped, or in such a redundant curve, that, when the weight of the body is thrown onto them, they allow the body to descend and the extension-straps to become relaxed. This effect of a pelvic band placed too high may be appreciated by reference to Fig. 1, in which

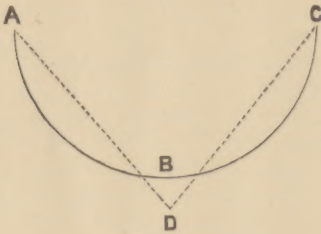


Fig. 1.

A B C represents a perineal strap attached to a pelvic band placed considerably above the level of that portion, represented by B, of the ischium and pubes which rests on the perineal strap. When the weight of the body is concentrated on B the point of support will be depressed from B to D. There will be a corresponding descent of the patient's

body, an approach of the heel of the affected side to the foot-piece of the splint and a relaxation of the extension-straps. If, on the other hand, the perineal strap is attached to a pelvic band placed but little above the level of the point of ischiatic support, as in

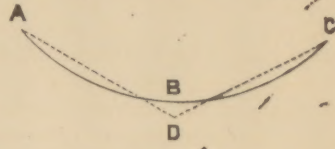


Fig. 2.

Fig. 2, there will be a comparatively slight displacement of the point of support from B to D and but little descent of the body and relaxation of the extension-straps.

In the third place, the relaxation of the extension-strap which occurs when the patient's body is upheld by the splint may be due to the compression of the soft parts covering the ischiatic and pubic regions of the pelvis and included in the bight of each perineal strap. This is especially true in the case of patients whose bones are covered with a redundancy of fat.

Aside from these three causes there is nothing about the apparatus, or the parts to which it is applied, that can contribute to a descent of the body and a relaxation of the extension-straps when the patient throws his weight upon the splint. This becomes sufficiently evident on the consideration of an imaginary case in which these causes are eliminated. Suppose, in the first place, a hip splint so inflexible that there shall be absolutely no yielding of the upright or of the pelvic band. Secondly, imagine a pair of inflexible perineal straps, we will substitute for the ordinary flexible straps a rigid iron bar laid upon the pelvic band. Finally, imagine a patient whose bones are so denuded that the pelvis shall rest directly on this unyielding framework. In a case thus situated it is evident that a descent of the body with a relaxed condition of the extension-straps is impossible, no matter how heavily the weight of the patient is thrown onto the apparatus.

Going still further, we may in imagination eliminate the two possible causes mentioned at the beginning of this paper as perhaps contributing to relaxation of the extension-straps when the patient is simply erect and has not

yet transferred his weight to the splint, we may suppose that the pendent limb is imponderable, and that the adhesive plasters are applied directly to the shaft of the femur without the intervention of the mobile soft parts. With this addition the hip-joint of our hypothetical patient may be subjected by the use of the rack and pinion to extension and counter-extension of such efficiency that not only will there be no relaxation visible in the extension-straps, but there will be exerted a permanent and equable degree of traction affected by absolutely nothing (except the weight of the splint in certain conditions), whatever be the attitude of the patient, whether he be recumbent or standing on the sound limb, or erect and throwing his weight onto the splint, or hanging suspended by the hands, or reversed, with his head on the ground and his feet in the air.

These fanciful but instructive hypotheses being dismissed from further consideration, the views above expressed may be summarized and presented in another form, as follows: The weight of the pendent limb alone and the weight of the entire body are two elements which interfere with the efficiency of the extension and counter-extension, which are exerted by the rack and pinion when the patient rises from the recumbent or sitting position. The former, the weight of the pendent limb, interferes when the patient stands, whether the weight of the body is resting on the splint or not, and, inasmuch as the traction applied by the rack and pinion in the recumbent position seldom, if ever, exceeds, when expressed in pounds, the weight of the pendent limb, it is believed that, in general, the effects of traction are felt more strongly in the erect than in the recumbent position. The weight of the entire body interferes when it is thrown onto the splint, which happens whenever, in the erect position, the patient raises the foot of the sound limb from the ground. It then becomes a most important factor. If there is any traction still exerted by the rack and pinion after the pendent limb has exerted the traction due to its weight, it is at once abolished by the downward pressure of the weight of the entire body, which brings nearer to each other the points whose persistent separation by the rack

and pinion is depended upon for the maintenance of extension on the one hand and counter-extension on the other. And, if there is still further yielding on the part of the splint, or the soft parts of the patient, the traction exerted by the weight of the pendent limb may also be abolished by the descent of the body till the heel rests on the foot-piece of the splint, which is the same as if it rested on the ground.

To make a practical application of these views, it is necessary, if we would avoid as much as possible the relaxation of the extension-straps, to pay attention to the three points which have been indicated. It will be found that in proportion as the relaxation of the extension-straps in the erect position and under the downward pressure of the weight of the body is prevented, in the same proportion the efficiency of the splint as a means of applying traction in the recumbent position will be increased, because the compression of the soft parts, the redundancy of the perineal straps and the flexibility of the steel frame are features which, in the recumbent as well as the erect position, undermine the stability of counter-extension, without which traction is, of course, impossible.

The relaxation which is due to compression of the soft parts covering the ischiatic and pubic regions of the pelvis is not of serious import because it is found that the continued pressure of the perineal straps eliminates the adipose tissue from the parts to which they are applied to such an extent that the perineal straps come to be applied to the pelvic bones with the intervention of an insignificant layer of integument and subcutaneous fibrous tissue. The relaxation due to a pelvic band placed too high may in a great measure be obviated by lowering the pelvic band till each perineal strap extends in a nearly straight line from front to rear. It will be found that certain other practical advantages attend this disposition of the pelvic band. It will thus be brought to occupy a level below that of the anterior superior spine of the ilium which is exposed to attrition when the pelvic band is worn too high. Further, when the perineal straps hang in deep loops from the pelvic band they do not retain their respective places in the perineal space unless their points of attachment to the pelvic band are widely separated

laterally, and a wider lateral separation of their points of attachment necessitates a larger pelvic band. It follows, then, that a low pelvic band with short perineal straps permits the use of a smaller and more closely fitting pelvic band which adds to the convenience of the patient as well as to the efficiency of the apparatus as a means of immobilizing the joint. Finally, the relaxation of the extension-straps which comes from a light and flexible steel frame can almost entirely be prevented by providing a frame sufficiently strong to meet the requirements of the case. It is difficult to overcome the prejudice which exists in the mind of the instrument-maker against a strong and inflexible splint. The

preferences of the intelligent and skilful workman must, however, be overruled in the interest of the patient and it will be found that a strong and unyielding splint will reduce to the minimum the relaxation of the extension-straps when the patient assumes the erect position and throws his weight onto the splint. It will also increase the efficiency of the apparatus as a means of fixing the joint; it will, by acting as a firm ischiatic crutch, the better protect the joint from the pressure and concussion incident to standing and walking and it will enable the patient to perform locomotion and to make progress towards recovery with speed, safety and comfort—*cito tuto et jucunde*.